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OFFICIAL

Fax Cover Letter

Please deliver the following pages to: Sing P. Chan

This facsimile is from Deborah A. Rypacek and is being transmitted on 7/27/2004 9:57:06 AM. The length of this fax, (including the cover letter), is 5 pages.

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Message

Examiner Chan:

Re US. Serial No. 09/898,633

Attached, as you requested, is the Declaration of Stephen D. Owens. Please call Attorney Kimberly L. Brown at 713-221-1189 if you have any questions, or need further information.

Regards,

Deborah A. Rypacek

CERTIFICATE OF FACSIMILE TRANSMISSION UNDER 37 C.F.R. 1.8(A)

I hereby certify that this correspondence is being forwarded by facsimile to the Attention of Sing P. Chan, at facsimile number 703-872-9306, c/o Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date indicated below.

Date: 7-26-04 Signed: Deborah A. Rypacek

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Ronald P. Schmidt

Serial No.: **09/898,633**

Filed: **07/02/2001**

For: **ADHESIVE-INFUSED 3-D WOVEN TEXTILE PREFORMS FOR STRUCTURAL JOINTS**

Attorney Docket No.: **TA-00519**

Examiner: **Sing P. Chan**

Group Art Unit: **1734**

DECLARATION

I, Stephen D. Owens, state the following:

I am employed by Lockheed Martin Corporation as an engineer. My title is Engineering Senior Staff, Joint Strike Fighter Airframe Certification. I have been employed with Lockheed Martin and its predecessor, General Dynamics, for nineteen years.

Lockheed Martin Corporation is the assignee of the above-identified patent application.

I am a co-author of a technical paper Interlaminar Reinforced Composites Development for Improved Damage Tolerance (copy of first page attached). That technical paper was

presented at a Closed Session of the Society for Advancement of Material and Process Engineering (SAMPE) in on May 22, 2000.

The majority of the teachings in the subject matter technical paper were derived from information provided to me by an inventor of the present patent application.

More specifically, part of the subject technical paper discusses a technique of bonding a woven pre-form to a composite component by providing a woven pi-shaped pre-form, which is infused with uncured resin, having a base and a pair of spaced apart legs that extend from the base and define a slot having inner surfaces. In this technique, the base of the pre-form is placed adjacent a surface of a composite component that is infused with an uncured resin. A plurality of pins are inserted to extend into the base. The resin in the pre-form and the component is then cured. This technique was derived from information provided to me by an inventor of the present patent application.

Similarly, part of the subject technical paper discusses a technique of assembling first and second components by providing a woven pre-form having a base and a pair of spaced apart legs extending from the base. The pre-form is then infused with resin and then applied onto a first component. A sizing tool is then inserted between the legs. The resin is then cured while the tool is located between the legs to define a slot. The tool is then removed and adhesive is applied to the slot, followed by insertion of the second component into the slot. The adhesive in the slot adheres to at least one surface of the second component at least one inner surface of the slot for retaining the second component within the slot. This technique was derived from information provided to me by an inventor of the present patent application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

July 26, 2004
Date

Stephen D. Owens

INTERLAMINAR REINFORCED COMPOSITES DEVELOPMENT FOR IMPROVED DAMAGE TOLERANCE

Steven Wanthal, Robin Wippich-Dienhart, Anne Cenedella
The Boeing Company, St. Louis, MO

Gerald Mabson, Lyle Deobald
The Boeing Company, Seattle, WA

Steve Owens
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Victor Li, Dave Kane
Northrop Grumman, El Segundo, CA

ABSTRACT

Studies have shown that more affordable composite structure can be achieved through the application of bonded/cocured designs. However, bonded/cocured joints without Z-direction reinforcement have demonstrated poor damage tolerance thereby limiting application of unitized designs on airframe structure. This paper summarizes several efforts within the Composite Affordability Initiative (CAI) - Pervasive program to evaluate and implement application of 3D textile preforms, stitching, and Z-fiber™ insertion technologies as a means to improve damage tolerance of composite structure. A review of the various Z-direction interlaminar reinforcement concepts and their limits of application will be presented. Specific applications of these technologies on CAI-developed structures will be reviewed. This paper also summarizes both the analytical and experimental work conducted to date on stitched and Z-fiber™ pinned skin-to-spar joints. Finally, this paper will address the current state-of-the-art in interlaminar reinforcements and suggest areas where further work is needed to prepare these processes for production.
